ONTARIO

Ministry of the ENVIRONMENT

Preliminary Report on Conversion to the Metric System

August 1972

MINISTRY OF THE ENVIRONMENT
PRELIMINARY REPORT
ON
CONVERSION TO THE METRIC SYSTEM

I N D E X

INTRODUCTION

This report has been prepared for submission to the Ontario Metric Office who will be receiving similar reports from other ministries in the Ontario Government. The objective of the Metric Office is to collate and digest the reports it receives and present this information to the Federal Preparatory Commission for Metric Conversion.

Within the terms of reference given by the Interministerial Committee on National Standards and Specifications. the three main headings in this report are: Training of Personnel· Equipment Replacement and Construction; Printing and Publicity. This approach has sometimes required that the problems of a Division or Branch be discussed under all three headings. However, the Project Construction Branch will be so deeply affected by a change-over to metric standards that its un-revised report is included in its entirety as an appendix (Appendix #6).

Correspondence on the subject of metric conversion has been established with some of the leading trade and professional associations. To date, opinions have been received from the Canadian Retail Hardware Association; the Ontario Section of the American Water Works Association; the Pollution Control Association of Ontario; and the Canadian Manufacturers of Chemical Specialties Association, as expressed in the appended copies of their letters. See appendicies.

Within the Ministry of the Environment, an Internal Committee on Metric Conversion has been formed. This Committee has held one meeting and it will continue to direct the Ministry's program. When information is required from any specific Division or Branch, it will be obtained from the appropriate delegate. The members of this Committee are listed in Appendix #7.

TRAINING OF PERSONNEL

The Ministry of the Environment is mainly staffed with people of technical or professional qualifications. The laboratory personnel are now working with equipment graduated in metric units. Those people who interpret laboratory reports must have a basic understanding of the metric system of measurement. For example, laboratory results are frequently reported as a ratio which was in the past given in parts per million, but is now expressed in milligrams per litre.

The foregoing statements do not take into account the fact that we wish to adopt Le système international d'unités" (SI) and not other metric systems which have been proposed, such as the CGS system or the MKS system. In this regard, personnel will require training and although this could be organized internally through seminars, it would be desirable if this could be done on an Ontario Government wide basis, by a group of professional educators.

It is in the area of equipment, components and fittings, manufactured to metric standards, that we expect our greatest problems. The practical knowledge of the metric size of pipes, fittings, etc., which will be carried by suppliers is not obtainable from text books or short courses. This information, however, will be required before amending the Plumbing Code or before specifying this type of equipment

in new designs. To keep abreast of the physical changes in equipment as metrication proceeds it will be necessary to have liaison with Standards Associations, manufacturers and suppliers.

It has been suggested that because of academic limitations, the water and sewage treatment plant operators may be the group which will have the most difficulty in understanding a new and unfamiliar system of measurement. If this proves to be the case, it will be necessary to re-calibrate all gauges and scales to preclude the need for mathematical conversions, and operating manuals and procedures will have to be amended accordingly.

EQUIPMENT REPLACEMENT AND CONSTRUCTION

As equipment needs to be replaced or as new equipment is ordered, there is no objection to ordering equipment built to metric standards provided that such equipment and replacement parts are readily available at competitive cost. It is understood that the foregoing statement should be interpreted within the limitations set by the purchasing policy of the Ontario Government.

Problems will undoubtedly develop where equipment or supplies, manufactured to metric standards, must be connected with non-compatible equipment and supplies. For example, how do you connect a metric size pipe having metric threads to a pump which is designed to accept a trade size of pipe measured in inches and having National Pipe threads? Another example is offered by watermains now in use which have a long life expectancy (100 years+) and will have to be connected by adaptors to metric size fittings and pipes.

It is expected that there will be ingenious solutions to some of these problems and there will probably be specialty items produced to meet the need until non-standard metric equipment and supplies are replaced. A similar situation frequently arises in industry when new models of equipment are produced.

The construction program is closely related to the equipment replacement program. The change-over in the construction field will most likely prove to be the most difficult conversion program with which the Ministry will have to cope. Therefore, a separate report is provided as Appendix #5. The reports suggests a ten year, four phase program, described as follows: a two year period to plan and review the program; next a five year period in which materials and equipment conversions are made; the following year is for design conversion and finally, in the last two years of the ten year plan, the actual construction conversion is made.

The equipment replacement program would be geared to the construction program, with new equipment being made to metric specifications becoming available from the fifth year onward.

PRINTING AND PUBLICITY

There is a printing and reproduction capability within the Ministry of the Environment. Each piece of equipment used for this purpose will be examined to determine its capability in relation to metric size paper and the equipment will be modified or replaced, when required. In this regard, direction and leadership is expected from the Ministry of Government Services, as the problems within the Ministry of the Environment will be similar to that of other ministries.

The following regulations will have to be amended so that metric units may be specified:

REGULATION	TITLE
O.Reg.10	Air contaminants from asphalt paving plants
O.Reg.11	Air contaminants from ferrous foundries
O.Reg.12	Air contaminants from vehicles
O.Reg.13	Air contaminants from 1969 model motor vehicles
O.Reg.14	Evaporative emissions from new light duty motor vehicles
O.Reg.15	General (Regulation under the Air Pollution Control Act)
O.Reg.645	Exemption from Section 38 (OWR Act)
O.Reg.647	Plumbing Code
O.Reg.648	Water wells
O.Reg.824	General (Regulations under the Waste Management Act)

Insofar as scheduling the change to metric units and sizes in regulations is concerned, it will be necessary to permit the use of both the SI and the Imperial systems for a period of approximately 5-8 years, depending upon the nature of the units used. In the case of the plumbing code, the metric units would be set out at the mid point in the materials conversion phase. Therefore, dual units would be available in the

fifth year of the ten year program. Certain other regulations may be changed at an earlier date to provide a longer conversion cycle. On the other hand, the cut-off date could be moved up to say year seven in the ten year program, in areas where equipment change-over is not critical.

At the appropriate time and co-ordinated with other government activities, the Information Services Branch will further the cause of metric conversion by using metric units in news releases. The size of pamphlets and posters will be governed by SI standards and as an educational measure, the metric dimensions could be printed on the literature.

The scheduling of the conversion of technical reports to SI units will relate directly to (a) the public who receive the reports and (b) the staff who prepare the reports. The preparation of report phase of conversion can be accomplished within a six month to a two year period. Some of the more technical or scientific reports designed for professional dissemination are already prepared using metric units. However, in reports to the public the Imperial system cannot be discarded entirely until the general public is familiar with the new system. This suggests that both systems be used in reports for a period of up to seven years after a proclaimed date for the commencement of metric conversion.

SUMMARY AND CONCLUSIONS

No difficulty is anticipated in the Ministry of the Environment in relation to the use of metric units in field work, laboratory work or report writing. A two year period should be sufficient to effect the change over, except that this schedule could be shortened for the work groups now using metric units in some of their activities. To match the training program in the public sector, dual units (Metric and Imperial) should be used for up to seven years in a ten year program.

As metric conversion affects standards and specifications, a ten year program seems appropriate and in line with the goals of other countries which have undertaken similar programs. The progress in this regard is contingent upon inter-woven activities in the commercial and industrial sectors. This Ministry can help to create a demand for equipment built to metric standards but activities of this nature should be co-ordinated on a National and Provincial wide basis.

Most of the Regulations under the Water Resources Act, the Air Pollution Control Act, and the Waste Management Act will have to be revised to include SI units. Particular difficulty is expected in the revision of the plumbing code (O.Reg.647) because standard metric sizes of plumbing materials are not interchangeable or compatible with materials fabricated to Imperial standards. It will be a matter of judgement if the next larger or the next smaller size of metric pipes should replace the present requirements.

Conversion to the metric system will have a great impact upon the Project Construction Branch and separate coverage on this subject is given in the appendix.

APPENDIX #1

LETTER FROM

CANADIAN RETAIL HARDWARE ASSOCIATION - ASSOCIATION CANADIENNE DES DÉTAILLANTS EN QUINCAILLERIE
290 MERTON STREET, TORONTO 295, ONTARIO, TELEPHONE 485-0793

OFFICE OF THE
EXECUTIVE DIRECTOR
(COPY)

July 31, 1972

Mr. D. Decaire, Secretary
Metric Conversion Committee,
Ministry of the Environment,
Government of Ontario,
135 St. Clair Avenue West,
TORONTO 195, Ontario.

Gentlemen:

This is in reply to your letter of July 26, 1972 concerning metric conversion.

We have considered the problem and do not consier that it will impose great difficulties on ourselves or the retail dealers we represent. In fact, we heartily endorse the proposal and look forward to working with metric units.

At the dealer level, we have long advocated the use of decimal packing (tens instead of dozens and hundreds instead of gross') because of the obvious advantage of calculating unit price. We know, of course, that there will be a period of trauma as dealers struggle to get used to descriptive dimensions of products (screws, hinges, etc.) expressed in metric terms, but this is overshadowed by the ultimate advantages. Even this difficulty will be overcome somewhat in that packages (under the new Packaging Act C-180) and products will be described in both traditional and metric units for some time allowing the dealer to see both in use side by side.

For our own part as an association, we maintain international ties with similar groups around the world. The chief advantage of such affiliation is in the exchange of statistics. We are constantly faced with the challenge of converting square meters to square feet and litres to gallons. European standards for fasteners, pegboards, and in infinite variety of other items have not been directly comparable to our own because the unit of measurement has been different, and in

setting standards, the trend is to use even units. For example, screw length in Canada is standardized to even inch units - 1 inch, 1 1/2 inches, 2 inches, etc. Converting these to metric, we get odd numbers such as 25 and a fraction mm. or 51 and a fraction mm. Europeans standardize to even 25 or 30 or 35 mm. lengths. The result is chaos in international exchange or products or statistics.

We are pleased to know of your interest and in the event that difficulties do occur, we may contact you. In the meantime, please be assured of our co-operation in any way that you may see fit.

Sincerely,

Thomas M. Ross, B.Sc.Phm., M.B.A.
Executive Director.

TMR/mw

APPENDIX #2

LETTER FROM ONTARIO SECTION, AMERICAN WATER WORKS ASSOCIATION

July 7, 1972

Mr. D. Decaire,
Ministry of the Environment,
Plumbing and Boating Section,
Sanitary Engineering Branch,
1st Floor,
135 St. Clair Avenue West,
Toronto 10, Ontario.

Dear Mr. Decaire:

Re: The Metric System of Measurement

I am in receipt of your letter of June 30, regarding Metrication and that you have established a Metric Office in the Standards, Design and Innovation Branch of the Ministry of Industry and Tourism. The conversion to the Metric System in the Water Works field is a matter of concern to the Ontario Section, and we would be pleased to work with you in making the transition as smooth as possible. We have corresponded with the Federal Government and we are aware of their progress in this matter.

The Ontario Section is holding its 1973 conference in Ottawa April 29 through May 2, and its technical committee will be providing reports and perhaps a panel to discuss the various aspects of this conversion. In this regard we feel that we can deal with the various manufacturers and define is some detail what problems might arise. It will be realized that technically, Water Works Industries are closely aligned with the United States, and this will have a bearing on the rate of progress. In this regard we are presently represented on a new committee of A.W.W.A., formed to report on Metrication in the United States.

We would welcome any suggestions you might have to guide the Ontario Section in its work. In the meantime, we will be pleased to keep you informed of our progress.

Yours truly,

A. P. Kennedy
Secretary Treasurer.

APK/cn

APPENDIX #3

LETTER FROM

POLLUTION CONTROL ASSOCIATION OF ONTARIO
P. O. Box 685, Station "B"
Willowdale, Ontario.

July 25, 1972

Mr. D. Decaire
Secretary
Metric Conversion Committee
Ministry of the Environment
135 St. Clair Avenue West
Toronto 195, Ontario

RE: THE METRIC SYSTEM OF MEASUREMENT

Dear Sir:

I should like to acknowledge receipt of your letter dated June 30th, 1972 in which you solicited comments from this association concerning Metric Conversion.

Your correspondence has been referred to the Executive of the association who are of the opinion that the association as a body could take little effective action in connection with the proposed Metric Conversion Programme. However many of the members of this association particularly those concerned with the manufacture of equipment will be vitally interested in the proposed Conversion Programme and will, we feel sure, have much to contribute on an individual basis.

The Association will be pleased to co-operate with the Metric Conversion Committee in any way possible and to make available to its membership any information that may come to hand from time to time.

It would be appreciated if you could keep us advised of any developments and let us know if we can be of assistance to you from time to time.

Yours very truly,

G. T. G. Scott
Secretary/Treasurer

GTGS/lb

APPENDIX #4

LETTER FROM

CANADIAN MANUFACTURERS OF CHEMICAL SPECIALTIES ASSOCIATION
EXECUTIVE OFFICES,
116 Albert Street, Suite 710, Ottawa, Ontario KIP 5 G 3
Tel: (613) 232-6616

(copy)

August 8th, 1972

Mr. D. Decaire,
Secretary,
Metric Conversion Committee,
Ministry of the Environment,
135 St. Clair Avenue West,
Toronto 195, Ontario.

Dear Mr. Decaire:

Thank you for your letter of July 26th, regarding the metric system of measurement.

Please be advised we have an active Divisional Committee studying the adoption of the metric system by the industry. This Committee will be reporting to the federal government in the fall.

We would be happy to send you a copy of this report at that time.

Yours sincerely,

Jacques Chevalier
Executive Secretary

:cac

APPENDIX #5

PRELIMINARY REPORT OF THE CONVERSION TO METRIC STANDARDS OF THE Project Construction Branch

Prepared by P. Joseph

INTRODUCTION

We in this Project Construction Branch are concerned primarily with the construction of water treatment plants, water pumping stations, reservoirs, trunk watermains and water distribution systems: sewage treatment plants, sewage pumping stations, trunk sewers and sewage collector systems. This work involves the whole range of building materials and equipment of all kinds including pumps, boilers, incinerators, stationary engines, a wide variety of mechanisms and supervisory control instruments and associated electrical equipment from large motors to electronic controls. Almost all trades would be represented in this work. We are thus involved with a wide range of industries with entwined and complex relationships.

It would appear then that the task of converting this Branch's activities to metric standards so intimately involves external relationships with consulting engineers, contractors equipment suppliers and perhaps trade unions that internal conversion such as in office procedures and systems is relatively simple and can be viewed in the context of the complete conversion.

Consequently there appears to be 4 stages inherent in the conversion to metric units. These are 1) Reporting 2) Materials conversion 3) Design conversion 4) Construction conversion. It is likely that stages can overlap and in some cases stages can be combined but essentially there will be advances step by step through Stage 1 to the final stage 4. The context and suggested time table of each of the stages is now discussed.

Stage 1 Reporting This stage would detail the complete process of conversion. It would be the "blueprint" of progress to metric standards reflecting the agreed opinions of the Associations, or at least most of them, with whom we work. It would involve joint committees with representatives of contractors, consulting engineers,

equipment suppliers and city engineers. The task of such committees would be to evaluate the existing use of metric standards, to examine ways and means to attain final conversion and to finally propose a recommended process of conversion throughout the construction industry allied where necessary to the equipment supply industry. The task would involve the establishment of a step-by-step timetable and estimates of cost including material costs for the duplication of spare parts in both the existing and metric systems.

This stage obviously involves the active co-operation of many organisations* and it is suggested that a 2 year period will be necessary to complete this stage.

* Refer to Appendix A for a primary list of Associations related to the work of this Branch.

Stage 2 Materials Conversion In order to properly design in metric standards it will be necessary for the materials with which the designer works to be in metric standards. It can be argued of course that the designer can convert materials made in existing standards to metric standards and design from there. However this method will lead to errors and is at best cumbersome and should be looked upon as an intermediate stage only.

The main materials with which a designer of water and sewage works is concerned is a follows. Pipes including vitrified clay, concrete reinforced and pre-stressed, asbestoc cement, poly-vinyl-chloride (PVS), polyethelene, cast-iron, ductile-iron, steel, copper and perhaps agricultural drain pipes; granular bedding and backfill materials which are calibrated in sieve sizes; manhole chambers, valve chambers and inspection chambers involving cast and pre-cast units together with covers and frames; concrete with mixes of cement, aggregate and water; steel reinforcement both in bars and fabric sizes; brickwork, blockwork, timber, glazing, structural steel in numerous sections and aluminum for steps, rails and gratings.

The designer works with a wide range of equipment which is here considered to be the responsibility of others and with which he will be required only to co-ordinate and not activate his design. However he is initmately concerned with valves and sluice-gates and these might properly be considered as part of the materials with which he works.

The establishment of metric standards in these materials no doubt involves the setting up of new Canadian Standards and would be a long process when the changeover of manufacturing processes is considered. Some materials such as concrete will be easier to convert than others but it is suggested that a 5 year period will be necessary for the complete conversion of this stage.

Stage 3 Design Conversion Design conversion will to a large extent be dependent on materials conversion. As the materials are converted to metric standards then the design in metric standards can be converted simultaneously or very shortly afterwards. In the conversion period it may be necessary to design both in existing and metric standards.

The design office is primarily concerned with hydraulic design of systems involving gravity and pressure flows through pipes, process design of treatment plants and pumping stations, structural design of buildings and ancillary services and the preparation of contract drawings and documents. The conversion to metric standards although requiring careful and expert consideration does not seem to be of such major proportions as the conversion in the materials industry. Drawing sizes and scales would be relatively easy to convert and measuring instruments such as levels, theodolities and tapes would not be difficult.

A number of formulae involving constants would have to be reviewed and reworked and no doubt a number of standard drawings would have to be revised.

Perhaps the main problem confronting the designer would be to acclimatize himself to the new "feeling" in the use of metric standards. He is familiar with the "feeling" of 1/2 ft/sec or 1 lb/in but the equivalent of 0.3048 m/s or 703 kg/m would likely be strange to him for a considerable time. The consulting engineers may consider it desirable therefore to undertake design in both existing and metric standards for a conversion period and this possible cost factor should be allowed for.

Notwithstanding this difficulty of familiarization it is suggested that the time period for the completion of this stage would be 1 year after the completion of stage 2 Materials Conversion.

Stage 4 Construction Conversion Contractors are involved with the capacity in terms of unit output of construction equipment, the maintenance performance of such equipment in terms of the availability and cost of spare parts, the performance output of the numerous trades under their control and the consequent scheduling, programming, pricing and measurement of their work items.

In order to work successfully in metric standards it would appear therefore that contractors' equipment should be calibrated in metric standards, the drawings and contract documents should be drawn up in metric standards and the contractors' engineers, estimators, technicians and workmen should be familiar in the use with metric standards,. The contractors, like the consulting engineers, may consider it necessary for themselves to work in dual units for a conversion period.

It is suggested that a time period of 2 years would be required for the completion of this stage after the completion of Stage 3 Design Conversion.

Summary of Time Table

Stage 1	Reporting	2 years
Stage 2	Materials Conversion	5 years
Stage 3	Design Conversion	1 year
Stage 4	Construction Conversion	2 years
	TOTAL	10 years

The equipment supply industry should thus be producing their equipment in metric standards after 8 years and the construction equipment industry should be producing their equipment in metric standards after 10 years.

It is understood that both the British conversion to metric standards started in 1965 and the U.S. conversion now in its preliminary stages have a 10 year time-table.

P. Joseph

PJ/ee

BIBLIOGRAPHY

The First Report of the Metrication Board 1970 published by HMSO London 1970.

Design in Metric Sewerage by Ronald E. Bartlett published by Elsevier Publishing Co. Ltd., Great Britain 1970.

APPENDIX 'A'

Primary List of Associations Related to Project Construction Branch

1. Consulting Engineers Associations

   Association of Professional Engineers of Ontario
   Engineering Institute of Canada
   Association of Consulting Engineers of Canada
   Canadian Electrical Manufacturers Association
   Canadian Society for Mechanical Engineering

2. Contractors Associations

   Ontario General Contractors Association
   Canadian Contractors Association
   Metro Toronto Sewer & Watermain Contractors Association
   Ontario Sewer & Watermain Contractors Association

3. Materials Supply Associations

   Ontario Concrete Pipe Association
   Canadian Institute of Steel Construction
   Portland Cement Association
   Canadian Structural Clay Association

4. Equipment Supply Associations

   Ontario Sanitation Equipment Association

5. General Associations

   City Engineers Association
   Canadian Manufacturers Association
   Canadian Standards Association
   Ontario Road Builders Association

APPENDIX - 6

Membership

MINISTRY OF THE ENVIRONMENT

INTERNAL COMMITTEE

ON

METRIC CONVERSION

NAME	BRANCH
W. T. Attree	Administrative Services
E. W. Stobart	Air Management
J. W. Vogt	Industrial Wastes
H. W. Tonkin	Personnel
G. Finan	Pesticide Control Service
M. Brandes	Private Waste and Water Management
C. Letman	Project Development
P. Joseph	Project Construction
C. W. Perry	Project Operations
M. Fielding	Research
G. R. Trewin	Sanitary Engineering
P. S. Isles	Waste Management
G. Pearce	Water Quality
C. Holland	Water Quantity Management

Secretary - D. Decaire
Sanitary Engineering Branch
5-6965

APPENDIX - 7

BASIC TEN YEAR CONVERSION SCHEDULE

YEAR #	PERSONNEL TRAINING	EQUIPMENT	CONSTRUCTION	REGULATIONS	TECHNICAL REPORTS	PAPER CONVERSION	PUBLICITY
1	General period; -of public awareness special training given to staff, -as required. Training programs to be coordinated -with other government EDUCATIONAL PROGRAMS.	obtain new equipment built to metric standards when possible. Conversion of meters & instruments for display in metric units.	Information collection, involving liaison with manufacturers, supplier, trade and professional associations. As metric standards are adopted, materials & equipment will become available. Some design and construction done to metric standards.	Preparation for publishing in dual units. Dual units published in regulations, when possible.	Selected reports to have dual units included. Dual units to be used in all reports.	Stationery supplies changeover to match Ontario Government Program.	Dual units used in news releases, information bulletins and pamphlets, etc.
2							
3							
4							
5							
6	Operator training related to the special features of new metric standard equipment.	New equipment built to metric standards should generally be available.					
7							
8	TRAINING COMPLETED	All new equipment will be built to metric standards. Final stage of conversion or replacement of old equipment to be complete.	Design changeover. Construction chageover.	Metric units in all regulations	All reports in metric units only	Changeover completed	Exclusive use of Metric Units.
9							
10							

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